

In the Claims

Please amend Claims 1-55.

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1. (Amended) A method of probing an object, the method comprising:
 - forming a reference structure comprising near-field antenna sensing elements, each sensing element having one or more characteristic frequencies of oscillation;
 - generating an electromagnetic field near the sensing elements;
 - coupling electromagnetically at least one sensing element to the object via the electromagnetic field; and
 - measuring changes in the characteristic frequencies that are caused by the coupling.
 2. (Amended) The method of Claim 1 further comprising:
 - determining physical parameters of the object from the measured changes in the characteristic frequencies.
 3. (Amended) The method of Claim 1 further comprising:
 - determining the presence of the object from the measured changes in the characteristic frequencies.
 4. (Amended) The method of Claim 1 further comprising:
 - determining the identity of the object from the measured changes in the characteristic frequencies.
 5. (Amended) The method of Claim 1 further comprising:
 - determining the position of the object from the measured changes in the characteristic frequencies.

6. (Amended) The method of Claim 1 further comprising:
determining the orientation of the object from the measured changes in the characteristic frequencies.
7. (Amended) The method of Claim 1 wherein measuring changes comprises using a frequency counter.
8. (Amended) The method of Claim 1 wherein the electromagnetic coupling is capacitive.
9. (Amended) The method of Claim 1 wherein the electromagnetic coupling is inductive.
- Q1 10. (Amended) The method of Claim 8, further comprising:
coupling an oscillator to each sensing element;
coupling a multiplexer to the oscillators; and
selecting, by the multiplexer, a combination of an oscillator and a sensing element for generating the electromagnetic field.
11. (Amended) The method of Claim 9, further comprising:
coupling an oscillator to each sensing element;
coupling a multiplexer to the oscillators; and
selecting, by the multiplexer, a combination of an oscillator and a sensing element for generating the electromagnetic field.
12. (Amended) The method of Claim 8, further comprising:
generating the electromagnetic field using an oscillator;
coupling a multiplexer to the oscillator and to the sensing elements; and
selecting, by the multiplexer, a sensing element for generating the electromagnetic field.
13. (Amended) The method of Claim 9, further comprising:

generating the electromagnetic field using an oscillator;
coupling a multiplexer to the oscillator and to the sensing elements; and
selecting, by the multiplexer, a sensing element for generating the electromagnetic field.

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14. (Amended) The method of Claim 8, further comprising:
selecting sensing elements for masking; and
selectively masking the selected sensing elements so that only the unmasked elements couple to the object.
15. (Amended) The method of Claim 9, further comprising:
selecting sensing elements for masking; and
selectively masking the selected sensing elements so that only the unmasked elements couple to the object.
16. (Amended) A method of Claim 1, further comprising:
coupling a multiplexer to an oscillator and to the antenna elements;
selecting, by the multiplexer, a plurality of antenna elements; and
generating an electromagnetic field using the oscillator and the selected antenna elements, the electromagnetic field being modulated to convey information to the object.
17. (Amended) A method of Claim 8, further comprising:
coupling a multiplexer to an oscillator and to the antenna elements;
selecting, by the multiplexer, a plurality of antenna elements; and
generating an electromagnetic field using the oscillator and the selected antenna elements, the electromagnetic field being modulated to convey information to the object.
18. (Amended) A method of Claim 9, further comprising:
coupling a multiplexer to an oscillator and to the antenna elements;
selecting, by the multiplexer, a plurality of antenna elements; and

generating an electromagnetic field using the oscillator and the selected antenna elements, the electromagnetic field being modulated to convey information to the object.

19. (Amended) The method of Claim 1, further comprising:

coupling at least one marker with the object, the at least one marker having electromagnetic properties substantially different from the electromagnetic properties of the object, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.

20. (Amended) The method in Claim 8, further comprising:

coupling at least one marker with the object, the at least one marker having electromagnetic properties substantially different from the electromagnetic properties of the object, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.

21. (Amended) The method in Claim 9, further comprising:

coupling at least one marker with the object, the at least one marker having electromagnetic properties substantially different from the electromagnetic properties of the object, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.

22. (Amended) The method of Claim 1, further comprising:

coupling at least one marker with the object, the at least one marker comprised of electrically conductive elements, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.

23. (Amended) The method in Claim 8, further comprising:

coupling at least one marker with the object, the at least one marker comprised of electrically conductive elements, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.

24. (Amended) The method in Claim 9, further comprising:

coupling at least one marker with the object, the at least one marker comprised of electrically conductive elements, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.

25. (Amended) The method of Claim 1, further comprising:

coupling at least one marker with the object, the at least one marker comprised of magnetically permeable elements, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.

26. (Amended) The method of Claim 8, further comprising:

coupling at least one marker with the object, the at least one marker comprised of magnetically permeable elements, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.

27. (Amended) The method of Claim 9, further comprising:

coupling at least one marker with the object, the at least one marker comprised of magnetically permeable elements, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.

28. (Amended) The method of Claim 1, further comprising:
coupling at least one marker with the object, the at least one marker having a dielectric constant substantially greater than the dielectric constant of the object, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.
29. (Amended) The method of Claim 8, further comprising:
coupling at least one marker with the object, the at least one marker having a dielectric constant substantially greater than the dielectric constant of the object, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.
30. (Amended) The method of Claim 9, further comprising:
coupling at least one marker with the object, the at least one marker having a dielectric constant substantially greater than the dielectric constant of the object, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.
31. (Amended) An apparatus for probing an object, the apparatus comprising:
a reference structure having a plurality of near-field antenna sensing elements, each sensing element having one or more characteristic frequencies of oscillation;
an electromagnetic field, at least one sensing element being coupled electromagnetically to the object via the electromagnetic field; and
a measuring device measuring changes in the characteristic frequencies that are caused by the coupling.

32. (Amended) The apparatus of Claim 31 wherein the measuring device comprises a frequency counter.
33. (Amended) The apparatus of Claim 31 wherein the coupling of the electromagnetic field to the object is capacitive.
34. (Amended) The apparatus of Claim 31 wherein the coupling of the electromagnetic field to the object is inductive.
35. (Amended) The apparatus of Claim 33, further comprising:
a plurality of oscillators, each oscillator being coupled to a respective sensing element; and
a multiplexer coupled to the oscillators, the multiplexer selecting a combination of an oscillator and a sensing element for generating the electromagnetic field.
36. (Amended) The apparatus of Claim 34, further comprising:
a plurality of oscillators, each oscillator being coupled to a respective sensing element; and
a multiplexer coupled to the oscillators, the multiplexer selecting a combination of an oscillator and a sensing element for generating the electromagnetic field.
37. (Amended) The apparatus of Claim 33, further comprising:
an oscillator; and
a multiplexer coupled to the oscillator and to the sensing elements, the multiplexer selecting a sensing element for generating the electromagnetic field using the oscillator.
38. (Amended) The apparatus of Claim 34, further comprising:
an oscillator; and

a multiplexer coupled to the oscillator and to the sensing elements, the multiplexer selecting a sensing element for generating the electromagnetic field using the oscillator.

39. (Amended) The apparatus of Claim 33 wherein a plurality of the sensing elements are masked so that only the unmasked sensing elements couple to the object.
40. (Amended) The apparatus of Claim 34 wherein a plurality of the sensing elements are masked so that only the unmasked sensing elements couple to the object.
41. (Amended) The apparatus of Claim 31, further comprising:
an oscillator; and
a multiplexer coupled to the oscillator and to the sensing elements, the multiplexer selecting a plurality of sensing elements, the electromagnetic field being generated using the oscillator and the selected sensing elements, the electromagnetic field being modulated to convey information to the object.
42. (Amended) The apparatus of Claim 33, further comprising:
an oscillator; and
a multiplexer coupled to the oscillator and to the sensing elements, the multiplexer selecting a plurality of sensing elements, the electromagnetic field being generated using the oscillator and the selected sensing elements, the electromagnetic field being modulated to convey information to the object.
43. (Amended) The apparatus of Claim 34, further comprising:
an oscillator; and
a multiplexer coupled to the oscillator and to the sensing elements, the multiplexer selecting a plurality of sensing elements, the electromagnetic field being generated using the oscillator and the selected sensing elements, the electromagnetic field being modulated to convey information to the object.

44. (Amended) The apparatus of Claim 31, further comprising:
at least one marker comprised of electrically conductive elements, the at least one marker coupled to the object, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.
45. (Amended) The apparatus of Claim 33, further comprising:
at least one marker comprised of electrically conductive elements, the at least one marker coupled to the object, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.
- Q1 46. (Amended) The apparatus of Claim 34, further comprising:
at least one marker comprised of electrically conductive elements, the at least one marker coupled to the object, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.
47. (Amended) The apparatus of Claim 31, further comprising:
at least one marker having electromagnetic properties substantially different from the electromagnetic properties of the object, the at least one marker coupled to the object, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.
48. (Amended) The apparatus of Claim 33, further comprising:
at least one marker having electromagnetic properties substantially different from the electromagnetic properties of the object, the at least one marker coupled to the object, the electromagnetic properties of the at least one marker causing the changes in the

characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.

49. (Amended) The apparatus of Claim 34, further comprising:

at least one marker having electromagnetic properties substantially different from the electromagnetic properties of the object, the at least one marker coupled to the object, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.

50. (Amended) The apparatus in Claim 31, further comprising:

at least one marker comprised of magnetically permeable elements, the at least one marker coupled to the object, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.

51. (Amended) The apparatus of Claim 33, further comprising:

at least one marker comprised of magnetically permeable elements, the at least one marker coupled to the object, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.

52. (Amended) The apparatus of Claim 34, further comprising:

at least one marker comprised of magnetically permeable elements, the at least one marker coupled to the object, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.

53. (Amended) The apparatus of Claim 31, further comprising:

at least one marker having a dielectric constant substantially greater than the dielectric constant of the object, the at least one marker coupled to the object, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.

54. (Amended) The apparatus of Claim 33, further comprising:

at least one marker having a dielectric constant substantially greater than the dielectric constant of the object, the at least one marker coupled to the object, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.

55. (Amended) The apparatus of Claim 34, further comprising:

at least one marker having a dielectric constant substantially greater than the dielectric constant of the object, the at least one marker coupled to the object, the electromagnetic properties of the at least one marker causing the changes in the characteristic frequencies, the spatial arrangement of the at least one marker enhancing the probing of the object.

Amendments to the claims are indicated in the attached "Marked Up Version of Amendments" (pages i - xxi).

Please add new Claims 56-63.

56. (New) An apparatus for probing an object, the apparatus comprising:

means for forming a reference structure from near-field antenna sensing elements, each sensing element having one or more characteristic frequencies of oscillation;

means for generating an electromagnetic field near the sensing elements, at least one means for sensing being coupled electromagnetically to the object via the electromagnetic field; and

means for measuring changes in the characteristic frequencies that are caused by the coupling.

57. (New) A method of sensing a specified object with respect to a reference surface, the method comprising:

providing an array of near-field antenna elements in the form of electrode or coil structures, heretofore termed "sensing elements";

generating electromagnetic signals via DC or AC coupling to sensing elements having one or more characteristic frequencies of oscillation;

providing a means for measuring the characteristic frequencies

coupling the generated electromagnetic field to the object capacitively and/or inductively via one or more sensing elements; and

measuring changes in the characteristic frequencies that are caused by the object, wherein the measured changes in characteristic frequencies are used to determine the identity of the object having known material properties;

58. (New) A method of sensing a specified object with respect to a reference surface, the method comprising:

providing an array of near-field antenna elements in the form of electrode or coil structures, heretofore termed "sensing elements";

generating electromagnetic signals via DC or AC coupling to sensing elements having one or more characteristic frequencies of oscillation;

providing a means for measuring the characteristic frequencies

coupling the generated electromagnetic field to the object capacitively and/or inductively via one or more sensing elements; and

measuring changes in the characteristic frequencies that are caused by the object, wherein the measured changes in characteristic frequencies are used to determine the 2-dimensional orientation of the object in the plane of the sensing surface;

59. (New) A method of sensing a specified object with respect to a reference surface, the method comprising:

providing an array of near-field antenna elements in the form of electrode or coil structures, heretofore termed "sensing elements";

generating electromagnetic signals via DC or AC coupling to sensing elements having one or more characteristic frequencies of oscillation;

providing a means for measuring the characteristic frequencies

coupling the generated electromagnetic field to the object capacitively and/or inductively via one or more sensing elements;

measuring changes in the characteristic frequencies that are caused by the object; and

modulating transmitted electromagnetic radiation in a manner which can be used to convey information to one or more external electronic devices receptive to the electromagnetic radiation.

60. (New) An apparatus for determining the position and orientation of a specified object with respect to a reference surface, the apparatus comprising:

a set of near-field antenna elements in the form of electrodes or coils;

a sensing array comprised of sensing elements;

at least one controlled oscillator that is DC or AC coupled to the sensing elements having one or more characteristic frequencies of oscillation;

measuring circuitry coupled to the sensing array adapted to measure changes in one or more the characteristic frequencies; and

masking elements for modulating transmitted electromagnetic radiation in a manner which can be used to convey information to one or more external electronic devices receptive to the electromagnetic radiation;

wherein the electromagnetic radiation is coupled to the object, and the changes in one or more the characteristic frequencies is used to derive position or orientation of the object.

61. (New) An apparatus for probing an object, the apparatus comprising:

means for forming a reference structure from near-field antenna sensing elements, each sensing element having one or more characteristic frequencies of oscillation;

means for generating an electromagnetic field near the sensing elements, at least one means for sensing being coupled electromagnetically to the object via the electromagnetic field; and

means for measuring changes in the characteristic frequencies that are caused by the coupling, the measured changes used to determine the identity of the object.

62. (New) An apparatus for probing an object, the apparatus comprising:

means for forming a reference structure from near-field antenna sensing elements, each sensing element having one or more characteristic frequencies of oscillation;

means for generating an electromagnetic field near the sensing elements, at least one means for sensing being coupled electromagnetically to the object via the electromagnetic field; and

means for measuring changes in the characteristic frequencies that are caused by the coupling, the measured changes used to determine the orientation of the object with respect to the reference structure.

63. (New) An apparatus for probing an object, the apparatus comprising:

means for forming a reference structure from near-field antenna sensing elements, each sensing element having one or more characteristic frequencies of oscillation;

means for generating an electromagnetic field near the sensing elements, at least one means for sensing being coupled electromagnetically to the object via the electromagnetic field;

means for oscillation; and